

INTERNSHIP REPORT

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SATHYABAMA INSTITUTE OF SCIENCE AND TECHNOLOGY

In partial Fulfilment for the Award of The Degree Of

BACHELOR OF SCIENCE

In

MEDICAL LABORATORY TECHNOLOGY

By

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DEPARTMENT OF MEDICAL LABORATORY TECHNOLOGY

SCHOOL OF ALLIED HEALTH SCIENCES

SATHYABAMA

INSTITUTE OF SCIENCE AND TECHNOLOGY

(DEEMED TO BE UNIVERSITY)

Accredited with Grade "A++" by NAAC

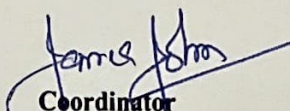
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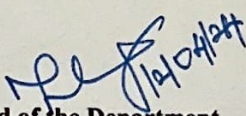
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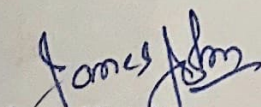
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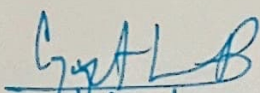
This is to certify that this internship report is the bonafide work of SABARISAN V who have done the project work as a team and carried out the training program at “VOLUNTARY HEALTH SERVICES at Adyar” and “EGMORE LIONS BLOOD BANK AND RESEARCH FOUNDATION-EGMORE” under our supervision from August 2023 to April 2024.


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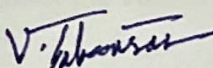

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DECLARATION

I, V. Sabarisan (41737014), hereby declare that the internship trainings done by me at **“LIONS BLOOD BANK AND RESEARCH FOUNDATION”** at Egmore under the guidance of **Ms. D. JASMINE PRIYA** and **“VOLUNTARY HEALTH SERVICES at Adyar”** under the guidance of **Dr. JAMES JOHN** at Sathyabama Institute of Science and Technology is submitted in partial fulfilment of the requirements for the award of Bachelor of science degree in **MEDICAL LABORATORY TECHNOLOGY**.

DATE: 12/04/2024

PLACE: CHENNAI


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CONTENTS

S.NO	TOPICS	PAGE. NO
1.	Introduction	1
2.	Phlebotomy	1
3.	Biochemistry	2
4.	Autoanalyzer	2
5.	Immunoassay Analyzer	3
6.	Hematology	4
7.	Bleeding Time	5
8.	Clotting Time	5
9.	Complete Blood Count And Differential Count	6
10.	Glycated Hemoglobin	7
11.	Leishman's Stain	8
12.	Pap's Stain	9
13.	Microbiology	10
14.	Gram Staining	11
15.	Ziehl-Neelsen	13
16.	Capsule Staining	14
17.	Media Preparation	16
18.	MacConkey Agar	16
19.	Nutrient Agar	16
20.	Blood Agar	16
21.	Chocolate Agar	16
22.	Autoclave	17
23.	Vitek	17
24.	Clinical Pathology	18
25.	Urine Routine	18
26.	Urine Strip	19
27.	Urine Deposit	19
28.	Stool Examination	20
29.	Serology	20
30.	CRP	21
31.	Widal	22
32.	VDRL	23
33.	HIV	24
34.	Blood Bank	25
35.	Introduction	25
36.	Blood Bank	25
37.	Blood Collection	26
38.	Blood Type	28
39.	Cross Matching	29

40.	Components Separation	30
41.	Screening Of Donar Blood	32
42.	Hepatitis B Virus	32
43.	Hepatitis C Virus	34
44.	Human Immune Deficiency Virus	35
45.	Malaria	36
46.	Blood banking-Internship Certificate	38
47.	Voluntary Health Services- Certificate	39
48.	Conclusion	40

INTRODUCTION

Place of visit:

1. Lions blood bank, Egmore
2. Voluntary Health Service (VHS), Adyar.

I have got good experience of observing all kinds of tests done in Blood Bank and diagnostic laboratory. We have learnt the tests under the departments of Blood bank, Phlebotomy, Clinical pathology, Microbiology, Biochemistry, Hematology, Serology. Here I have prepared the report of my whole Internships.

PHLEBOTOMY

PROCEDURE

- Preparation: Gather necessary supplies, including gloves, tourniquet, alcohol wipes, tubes for collecting blood, and a needle.
- Patient Identification: Confirm the patient's identity using two identifiers, such as their name and date of birth.
- Positioning: Ensure the patient is in a comfortable position, usually sitting or lying down with their arm extended and palm facing upward.
- Venipuncture Site Selection: Choose an appropriate vein, often in the inner elbow area, and apply a tourniquet to make the vein more visible and accessible.
- Vein Disinfection: Cleanse the skin around the selected venipuncture site with an alcohol wipe to reduce the risk of infection.
- Needle Insertion: Use a sterile needle to puncture the skin and enter the vein. Hold the needle steady and apply gentle pressure to advance it into the vein.
- Blood Collection: Once the needle is in the vein, blood will begin to flow into the collection tubes. Fill the tubes in the appropriate order as specified by the laboratory.
- Removal of Tourniquet: Release the tourniquet once blood flow is established to prevent discomfort and minimize the risk of hematoma formation.

- **Needle Removal:** Once all blood samples are collected, withdraw the needle smoothly and apply pressure to the puncture site with gauze to prevent bleeding.
- **Post-Procedure Care:** Dispose of used needles and other sharps properly. Apply a bandage to the puncture site if necessary and provide instructions to the patient for aftercare.
- **Labeling and Transport:** Label the blood samples with patient information and ensure they are properly stored and transported to the laboratory for analysis.
- **Documentation:** Document the procedure, including the date, time, patient information, and any relevant observations or complications.

BIOCHEMISTRY

AUTO ANALYZERS

- Auto analyzers used in biochemistry laboratories perform a wide range of tests to analyze various components of blood, urine, and other body fluids. Some common tests done by auto analyzers in biochemistry include:
- **Glucose:** Measures blood sugar levels, important for diagnosing and monitoring diabetes.
- **Electrolytes:** Tests for sodium, potassium, chloride, and bicarbonate levels, crucial for maintaining electrolyte balance in the body.
- **Liver function tests (LFTs):** Includes tests for enzymes such as alanine transaminase (ALT), aspartate transaminase (AST), alkaline phosphatase (ALP), and bilirubin to assess liver health and function.
- **Kidney function tests:** Measures creatinine, blood urea nitrogen (BUN), and electrolytes like sodium and potassium to assess kidney function.
- **Proteins:** Measures total protein levels and specific proteins such as albumin and globulins.
- **Lipids:** Measures cholesterol, triglycerides, and sometimes other lipid parameters to assess cardiovascular health.
- **Enzymes:** Measures levels of various enzymes in the blood, such as amylase, lipase, and creatine kinase (CK).
- **Hormones:** Measures levels of hormones such as thyroid hormones (T3, T4), thyroid-stimulating hormone (TSH), cortisol, testosterone, estrogen, and progesterone.

- Markers of inflammation and infection: Includes tests for C-reactive protein (CRP), erythrocyte sedimentation rate (ESR), and markers of specific infections.
- Tumor marker: Measures levels of certain proteins or substances that may indicate the presence of cancer, such as prostate-specific antigen (PSA), CA-125, and alpha-fetoprotein (AFP).



Figure-1

IMMUNOLOGY ASSAY ANALYZER

- **Model: Roche Cobas E411**
- Hormone assays: Tests for hormones such as thyroid-stimulating hormone (TSH), thyroid hormones (T3 and T4), cortisol, testosterone, estrogen, progesterone, and growth hormone.
- Tumor marker assays: Measures levels of tumor markers like prostate-specific antigen (PSA), CA-125, alpha-fetoprotein (AFP), carcinoembryonic antigen (CEA), and others.
- Cardiac marker assays: Measures proteins associated with heart damage or stress, including troponin, creatine kinase-MB (CK-MB), and brain natriuretic peptide (BNP).
- Infectious disease assays: Tests for antibodies or antigens related to infectious diseases such as HIV, hepatitis B and C, syphilis, and others.
- Autoimmune disease assays: Measures antibodies associated with autoimmune diseases like rheumatoid arthritis, systemic lupus erythematosus (SLE), and celiac disease.
- Allergy testing: Measures levels of allergen-specific IgE antibodies to identify allergic reactions to specific substances.
- Thyroid antibody assays: Detects antibodies associated with thyroid disorders, such as thyroid peroxidase antibodies (TPOAb) and thyroglobulin antibodies (TgAb).

- Fertility hormone assays: Measures hormones related to fertility and reproductive health, such as luteinizing hormone (LH), follicle-stimulating hormone (FSH), and human chorionic gonadotropin (hCG).
- Vitamin assays: Measures levels of vitamins such as vitamin D and vitamin B12.



Figure- 2

HEMATOLOGY

INTRODUCTION

In this department of lab I learnt about all the tests related to blood like CBC, DC, ESR, and tests which comes under coagulation and also I observed the procedure for staining like PAP stain and Leishman stain.

BLOOD SAMPLE:

- EDTA Tube
- Sodium citrate Tube

TESTS:

- ✓ Bleeding time
- ✓ Clotting time
- ✓ Complete blood count
- ✓ Differential count
- ✓ Erythrocyte sedimentation rate
- ✓ Glycated hemoglobin
- ✓ Activated partial thromboplastin time

✓ Prothrombin time

BLEEDING TIME

PROCEDURE

The tip of the left ring finger is pricked with aseptic prediagon(3-4mm). The blood should flow freely without spending. The time of puncting is noted with a filter paper the blood in gently block become smaller. This procedure is repeated until no blot appear on the filter paper the time is noted again the number of bolts $\times 30$ seconds be the bleeding time.

Normal range: 2-7 minutes.

CLOTTING TIME

PREPARATION OF SAMPLE

Transfer the collected blood into a clean, dry test tube without any anticoagulant.

PROCEDURE

1. Collect a blood sample using a sterile needle and syringe, typically from a vein in the arm.
2. Transfer the blood sample into a clean, dry tube without anticoagulant. Allow the blood to clot naturally at room temperature.
3. Check the sample at regular intervals for signs of clot formation. This is usually done by tilting the tube gently to see if the blood has solidified.
4. Note the time it takes for the blood to clot completely. This time period is the clotting time.
5. Compare the clotting time to a standard range. Normal clotting time varies but is typically around 8 to 15 minutes.
6. Document the clotting time and any relevant observations.

Normal range: 8-15 minutes

COMPLETE BLOOD COUNT(CBC) AND DIFFERENTIAL COUNT (DC)

PRINCIPLE

Blood is sampled and diluted, and moves through a thin tube which is enough that cells pass by one at a time. Characteristics about the cell are measured using lasers (fluorescence flow cytometry) or electrical impedance.

SAMPLE PREPARATION

Blood is collected in EDTA (purple) tube. Mix thoroughly. Whole blood is used for testing.

PROCEDURE

- Whole blood sample is used to run this test.
- Sample is mixed gently before placing in to the reaction vial.
- 20samples can run at a time. Two sections are there to run. Each section can run 10 samples.
- After arranging the samples give a comment of run.

PARAMETERS OF CBC

WBC, RBC, HGB, HCT, MCV, MCH, MCHC, PLT, RDW-SD, RDW-CV, PDW, MPV, P-LCR, PCT.

PARAMETERS OF DC

Neutrophil, Lymphocytes, Monocytes, Eosinophil, Basophil and Immunoglobulin

All the parameters are entered in both count and percentage.



Figure-3

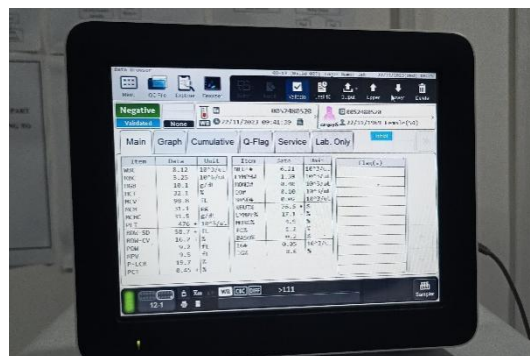


Figure-4

GLYCATED HEMOGLOBIN

MACHINE: BIO RAD

SAMPLE PREPARATION

Blood is collected in EDTA (purple) tube. Mix thoroughly. Whole blood is used for testing.

PROCEDURE:

- Turn on the analyzer and allow it to initialize.
- Prepare the HbA1C test samples by collecting the blood in EDTA Tube and mix the sample by rotating the tube gently it allows the blood to mix with anticoagulant.
- Load the test samples into the analyzer. We need to make sure to correctly label each sample to avoid mix-ups during analysis.
- Start the analysis process on the analyzer. This may involve selecting the appropriate test protocol and running the analyzer according to the specified settings.
- Monitor the progress of the analysis on the analyzer's display screen
- Once the analysis is complete, review the results provided by the analyzer. Check for any errors or inconsistencies in the results and troubleshoot as necessary. Record the results of the HbA1C analysis in the patient's medical records or laboratory documentation



Figure- 5

STAINING

LEISHMAN'S STAIN

PRINCIPLE

Leishman's stain is a polychromatic stain that contains methylene blue, eosin Y, and azure B. It stains the different components of blood cells differently, allowing for their differentiation and identification under a microscope. Methylene blue stains the nuclei of cells blue, while eosin stains the cytoplasm and some granules pink or red.

MATERIAL REQUIRED

1. Leishman's stain solution
2. Buffered water
3. Clean glass slides
4. Blood sample
5. Absolute methanol
6. Microscope with oil immersion lens
7. Cover slips (optional)

PROCEDURE

1. Prepare a thin blood smear on a clean glass slide.
2. Allow the smear to air dry completely.
3. Fix the smear by immersing it in absolute methanol for 1-2 minutes.
4. Prepare the Leishman's stain by diluting it with buffered water according to the manufacturer's instructions.
5. Place the fixed smear in the Leishman's stain solution for 5-10 minutes.
6. Rinse the slide with buffered water to remove excess stain.
7. Allow the slide to air dry completely.

8. Once dry, examine the stained blood smear under a microscope using oil immersion to observe the stained blood cells and any parasites present.



Figure-6

PAP STAIN

PRINCIPLE

The Pap stain involves a combination of acidic and basic dyes, which selectively stain different cellular components to enhance the visualization of cell morphology. This staining technique allows for the identification of abnormal cells, including precancerous and cancerous cells, as well as other cellular changes indicative of infection or inflammation.

MATERIAL REQUIRED

1. Hematoxylin solution
2. Eosin solution
3. Fixative solution (e.g., 95% ethanol)
4. Graded alcohol series (e.g., 70%, 95%, 100%)
5. Clearing agent (e.g., xylene)
6. Clean glass slides
7. Cervical smear sample
8. Microscope

PROCEDURE

1. Prepare a thin, monolayer cervical smear on a clean glass slide by spreading a sample collected from the cervix using a spatula or brush.

2. Fix the smear by immersing the slide in a fixative solution, typically an alcohol-based fixative like 95% ethanol, for a few minutes. This helps preserve cellular morphology.
3. Apply a hematoxylin solution to the smear for several minutes. Hematoxylin stains the nuclei of cells blue-purple.
4. Rinse the slide in water or an acid alcohol solution to remove excess hematoxylin and to differentiate the staining.
5. Apply an eosin solution to the smear for a short period. Eosin stains the cytoplasm and other acidic cellular components pink or red.
6. Dehydrate the slide by passing it through a series of graded alcohols (e.g., 70%, 95%, 100%) to remove water and then clear it with a clearing agent (e.g., xylene). Finally, mount the slide with a mounting medium and cover slip.
7. Examine the stained slide under a microscope using various magnifications to assess cellular morphology and detect any abnormalities.

Conclusion:

I have got knowledge about instruments used in hematology lab and to operate them. Procedure for counting blood cells by staining method also I learnt.

MICROBIOLOGY

INTRODUCTION

I have thoroughly learnt about all techniques which carried out in Microbiology laboratory. It is a place for working with a variety of microorganisms. Since several culture media are prepared and organic materials are present, chances exist for the presence of high spectrum of microbial community.

SAMPLES USED IN MICROBIOLOGY LAB:

Sputum

Urine

Stool

Blood

Pus

Throat swab

Wound swab

Et tube

Surface sample

GRAM STAIN

Gram staining is a widely used microbiological technique to differentiate bacteria into two groups based on their cell wall composition: Gram-positive and Gram-negative.

PRINCIPLE

1. The primary stain, crystal violet, is applied to the bacterial smear.
2. Iodine is added to form a crystal violet-iodine complex within the cell.
3. Ethanol or acetone is used as a decolorizing agent. This step differentially removes the dye from Gram-negative bacteria but not from Gram-positive bacteria due to differences in cell wall structure.
4. A counterstain, usually safranin, is applied to the smear, staining the decolorized Gram-negative bacteria pink or red while the Gram-positive bacteria remain purple.

MATERIAL REQUIRED

1. Bacterial culture
2. Microscope slides
3. Bunsen burner or slide warmer
4. Crystal violet stain
5. Gram's iodine solution
6. Ethanol or acetone

7. Safranin stain
8. Distilled water
9. Immersion oil (for oil immersion microscopy)
10. Microscope

PROCEDURE

1. Prepare a bacterial smear by placing a small drop of water on a clean microscope slide. Transfer a small amount of the bacterial culture onto the slide and spread it evenly. Allow it to air dry.
2. Fix the smear by passing it through the flame of a Bunsen burner or placing it on a slide warmer.
3. Flood the smear with crystal violet stain and let it sit for 1 minute.
4. Rinse the slide with distilled water to remove excess stain.
5. Flood the smear with Gram's iodine solution and let it sit for 1 minute.
6. Decolorize the smear by gently rinsing it with ethanol or acetone until the runoff appears clear (typically 5-10 seconds). Be cautious not to over-decolorize.
7. Immediately rinse the slide with distilled water to stop the decolorization process.
8. Counterstain the smear by flooding it with safranin stain and allowing it to sit for 1 minute.
9. Rinse the slide with distilled water and blot it dry with bibulous paper or a paper towel.
10. Examine the stained smear under the microscope using oil immersion for high-resolution observation. Gram-positive bacteria will appear purple, while Gram-negative bacteria will appear pink or red.

ZIEHL-NEELEN:

PRINCIPLE

1. Acid-fast bacteria have a waxy lipid layer in their cell walls, which makes them resistant to conventional staining methods.
2. Ziehl-Neelsen staining employs a lipid-soluble dye and heat to penetrate this lipid layer, allowing the dye to bind to the bacterial cell wall.
3. Once stained, acid-fast bacteria retain the dye despite subsequent decolorization steps using acid-alcohol.
4. A counterstain, such as methylene blue, is then used to stain non-acid-fast organisms.

MATERIAL REQUIRED

1. Bacterial culture or specimen
2. Microscope slides
3. Bunsen burner or slide warmer
4. Carbofuchsin (primary stain)
5. Acid-alcohol (decolorizing agent)
6. Methylene blue (counterstain)
7. Distilled water
8. Immersion oil (for oil immersion microscopy)
9. Microscope

PROCEDURE

1. Prepare a bacterial smear by spreading a thin layer of the bacterial culture or specimen on a clean microscope slide.
2. Fix the smear by passing it through the flame of a Bunsen burner or placing it on a slide warmer.
3. Flood the smear with carbofuchsin stain and heat gently using a Bunsen burner or slide warmer for 5 minutes (do not boil).

4. Rinse the slide with distilled water to remove excess stain.
5. Decolorize the smear by gently rinsing it with acid-alcohol until the runoff appears clear (typically 20-30 seconds).
6. Immediately rinse the slide with distilled water to stop the decolorization process.
7. Counterstain the smear by flooding it with methylene blue stain and allowing it to sit for 1-2 minutes.
8. Rinse the slide with distilled water and blot it dry with bibulous paper or a paper towel.
9. Examine the stained smear under the microscope using oil immersion for high-resolution observation. Acid-fast bacteria will appear bright red or pink, while non-acid-fast organisms will appear blue.

CAPSULE STAINING

PRINCIPLE

Capsule staining relies on the fact that bacterial capsules are poorly stained by traditional stains due to their non-ionic nature. Therefore, a negative staining technique is employed, where the bacterial cells are stained, but the capsules remain unstained or appear as clear halos around the cells.

MATERIALS REQUIRED

1. Bacterial cultures containing organisms with capsules
2. Glass slides
3. Bunsen burner or alcohol lamp
4. Inoculating loop or needle
5. Staining reagents:
 - Primary stain: Crystal violet or Congo red
 - Secondary stain: Maneval's solution or copper sulfate
6. Microscope

7. Immersion oil (if using an oil immersion lens)
8. Distilled water
9. Bibulous paper or blotting paper

PROCEDURE

1. Prepare a clean glass slide and label it with the sample identifier.
2. Place a small drop of water on the slide.
3. Using a sterilized inoculating loop or needle, emulsify a small amount of the bacterial culture in the water droplet to create a thin smear.
4. Allow the smear to air dry completely.
5. Fix the smear by passing it through the flame of a Bunsen burner or alcohol lamp a few times. Be careful not to overheat the slide.
6. Flood the slide with the primary stain (e.g., crystal violet or Congo red) and let it stand for 1-2 minutes.
7. Gently rinse the slide with distilled water to remove excess stain.
8. Blot the slide with bibulous paper to remove excess water.
9. Flood the slide with the secondary stain (e.g., Maneval's solution or copper sulfate) for 1-2 minutes.
10. Gently rinse the slide with distilled water.
11. Blot the slide to remove excess water.
12. Allow the slide to air dry completely.
13. Examine the stained smear under the microscope using the oil immersion lens if available.
14. Bacterial cells will appear stained, while capsules will appear as clear halos around the cells.

Ensure proper handling and disposal of bacterial cultures and staining reagents following laboratory safety protocols.

MEDIA PREPARATION

MAC CONKEY'S AGAR

PREPARATION

Suspend 55.04 grams in 1000mLab distilled Water. Heat to boiling to Re Dissolve the medium completely. Sterilize by autoclaving at 15 lbs pressured (121°C) for 15 minutes. Cool to 45-50°C. Mix well and pour into sterile Petri P Plates. It is preferred to dry surface of media plate before inoculation.

NUTRIENT AGAR

PREPARATION

Suspend 28.0 grams in 1000 ml purified/distilled water. Heat to boiling to dissolve the medium completely. Sterilize by autoclaving at 15 lbs pressure (121°C) for 15 minutes. Cool to 45 50°C. If desired, the medium can be enriched with 5-10% blood or biological fluids. Mix well and pour into sterile Petri plates.

BLOOD AGAR

PREPARATION:

Spend 40.0 grams in 1000 mi purified dueled water. Heat to boiling to dissolve the medium completely. Sterilize by autoclaving at 15lbs pressure (125°C) for 15 minutes. Coot to 45-60°C and aseptically add Stew sterile deformed blood. Mix well and pour into sterile Petri plates.

CHOCOLATE AGAR

PREPARATION:

Suspend 45.5 grams in 495mi purplel distilled water. Heat to boiling to dissolve the medium completely. Seize by autoclaving at 15 lbs pressure (121°C) for 15 minutes. Cool to 45-50°C. Aseptically add equal amount (435) of stele 25% Hemoglobin solution (FD022). Also atelicity add

the retreated contents of ante vial of Yeast Auto lysate Supplement (FD027) or Vitamins Growth Supplements (F0025). Mix well and pour into sterile Pelt plates. When single strength medium Is dished, suspend 45.5 gages in 1000 ml purified idled water

AUTOCLAVING

Autoclaving is a process that use moist heat and pressure so that all parts of the material to be sterilized reach 121 degree Celsius for 15 minutes. An autoclave is a large pressure cooker; a chamber which sealed off against surrounding air.

OBJECTIVE

To prepare sterile condition for culturing microorganisms.

MATERIALS REQUIRED

Commercial nutrient agar, Balance, Distilled water, Scott bottles, Measuring cylinder beaker, Forceps, Universal bottles.

PROCEDURE

- Appropriate amount of agar powder is weighed and dissolved with distilled water into the measuring cylinder. They are mixed well.
- The bottles are closed with non-absorbent cotton and wrapped with silver sheets. Set aside for sterilization.
- All the media are sterilized at 121 degree Celsius for 15 minutes.
- After autoclaving, the media is removed. The broth preparation is allowed to cool.

VITEK 2

1. The sample is inoculated into the VITEK 2 cards or cassettes containing growth media.
2. The inoculated cards are then incubated within the VITEK 2 system, which provides optimal conditions for bacterial growth.
3. The system automatically reads the growth and interprets the results based on various parameters such as growth patterns, biochemical reactions, and other characteristics.
4. The system uses its extensive database to identify the microorganisms present in the sample based on their unique characteristics and reactions.

5. For bacteria, the system can also perform antimicrobial susceptibility testing to determine the most effective antibiotics for treatment.
6. Once the analysis is complete, the system generates a report with the identified microorganisms and their susceptibility patterns, which can then be reviewed by laboratory staff and clinicians for appropriate patient management.



Figure-7

CLINICAL PATHOLOGY

In this session I gained knowledge about procedures for urine routine and physical examination of stool sample.

- Urine strip
- Urine deposit
- Wet mount for stool
- Physical examination of stool
- Occult blood

URINE ROUTINE

PROCEDURE

1. You'll be given a sterile container to collect a midstream urine sample. This means you'll start urinating, then collect the sample midstream to minimize contamination.
2. Make sure to label the container with your name, date, and any other required information.

3. Transport the sample to the laboratory as soon as possible. It's best to deliver it within one to two hours, but if that's not possible, refrigerate it until you can.
4. In the laboratory, technicians will analyze the sample for various factors, including color, clarity, pH, specific gravity, presence of protein, glucose, ketones, bilirubin, urobilinogen, nitrites, and leukocytes. They'll also examine it under a microscope for the presence of red blood cells, white blood cells, bacteria, crystals, and other substances.
5. Once the analysis is complete, your healthcare provider will receive the results. They'll interpret the findings and discuss them with you, along with any necessary follow-up or treatment.

URINE STRIPS

Remove a test strip, taking care not to touch the reaction fields. Immediately close the container again, this protects the remaining test strips from humidity and guarantees strip integrity up to the expiry date indicated

Dip the test strip for about 1 second into the fresh urine specimen. Wipe off any excess urine on the rim of the vessel and blot the edge of the test strip on tissue paper

Read the result by comparing the test fields with the color scale on the test .



Figure-8

URINE DEPOSITE

The purpose of Urine deposit is to provide information about the presence of pus cell, RBC, Epithelial cells, any bacteria and any other substance

PROCEDURE

- Take urine sample and pour into centrifuge tube.
- Centrifuge with another balance test tube for 5 min at 2500 RPM.
- Pour off supernatant quickly.
- Resuspend the deposit by shaking tube.
- Place 1 drop of deposit on a glass slide.
- Cover it with cover slip.
- Observe it under 40 x.

STOOL EXAMINATION

PROCEDURE

1. A drop of normal saline is placed on the Centre of a clean slide.
2. About 2 mg of the given sample of stool is emulsified in the saline.
3. A cover slip is then placed on the emulsion avoiding air bubbles.
4. After reducing the light by lowering the condenser and using the concave mirror, the preparations first screened under low power.
5. When a cyst or an ovum is seen the details are observed by focusing under high power.
6. If cysts are seen, another preparation is made by emulsifying about 3 mg, of stool sample in Lugol's iodine. This helps to stain the nuclei.

SEROLOGY

Serology is the branch of medical science that deals with the study of blood serum, particularly in relation to the immune response to pathogens or other foreign substances in the body. Serological tests detect antibodies, antigens, or other markers present in the blood or other bodily fluids. These tests are used to diagnose infections, assess immune status, monitor treatment effectiveness, and investigate immune-mediated diseases.

SAMPLES

- Blood
- Urine
- Saliva
- Semen
- Throat swab

TESTS TO BE DONE IN THIS LAB

- RA Factor
- CRP
- Widal
- VDRL
- HIV Screening Test
- HBsAg Screening Test
- HCV Screening Test

CRP:

CRP stands for C-reactive protein, which is a substance produced by the liver in response to inflammation. It is a commonly measured marker of inflammation in the body. Here's an overview of the principal, procedure, and interpretation of CRP testing

PRINCIPLE

- ✓ CRP testing is typically performed using a blood sample.
- ✓ The test measures the level of CRP present in the blood.
- ✓ CRP levels rise rapidly in response to inflammation or tissue injury.
- ✓ The test helps in diagnosing and monitoring various inflammatory conditions, such as infections, autoimmune disorders, and cardiovascular diseases.

PROCEDURE

- ✓ A blood sample is collected from a vein in the arm using a needle.
- ✓ The sample is then sent to a laboratory for analysis.

- ✓ In the laboratory, the level of CRP in the blood is measured using various techniques, such as immunoturbidimetry or enzyme-linked immunosorbent assay (ELISA).
 - Results are typically reported in milligrams per liter (mg/L) of CRP.
- ✓ Interpretation:
- ✓ Normal CRP levels are generally below 10 mg/L.
- ✓ Elevated CRP levels (greater than 10 mg/L) may indicate inflammation in the body.
- ✓ The degree of elevation in CRP levels can vary depending on the severity and location of the inflammation.
- ✓ High CRP levels can be seen in conditions such as bacterial or viral infections, rheumatoid arthritis, inflammatory bowel disease, and acute coronary syndrome.
- ✓ CRP levels can also be used to monitor response to treatment or disease activity over time.



Figure-9

WIDAL TEST

The Widal test is a diagnostic test for typhoid fever, caused by *Salmonella typhi* and *Salmonella Paratyphi*.

PRINCIPLE

The Widal test detects antibodies (agglutinins) produced by the body in response to infection by *Salmonella typhi* and *Salmonella paratyphi*. It is based on the principle of agglutination, where the antibodies present in the serum of the patient react with specific antigens present in the bacterial suspension, causing visible clumping (agglutination) of the bacteria.

PROCEDURE

1. Serum samples are collected from the patient.

2. The serum is diluted and mixed with suspensions of *Salmonella typhi* and *Salmonella para typhi* antigens.

3. The mixtures are incubated for a specific period.

4. After incubation, the samples are examined for visible agglutination, indicated by clumping of bacteria. This indicates the presence of specific antibodies in the patient's serum.

INTERPRETATION

Interpretation of the Widal test results depends on the titers of antibodies observed and the clinical symptoms of the patient:

- A four-fold rise in titer (e.g., from 1:20 to 1:80) between acute and convalescent phases is suggestive of typhoid fever.
- A single high titer of antibody (e.g., $\geq 1:160$ for anti-O and/or anti-H) in the acute phase is also considered indicative of typhoid fever.
- Interpretation should be done cautiously, considering clinical symptoms, history of vaccination, and prevalence of typhoid in the region, as false positives and negatives can occur.

It's important to note that while the Widal test can aid in the diagnosis of typhoid fever, it's not always definitive and should be interpreted alongside other clinical and laboratory findings.

VDRL (Venereal Disease Research Laboratory)

PRINCIPLE

The VDRL test detects antibodies produced by the body in response to infection with *Treponema pallidum*, the bacterium that causes syphilis. It is based on the principle of flocculation, where the antibodies present in the serum of the patient react with cardiolipin, a substance derived from beef heart, and lecithin, causing visible clumping (flocculation) of the antigen-antibody complexes.

PROCEDURE

1. Serum samples are collected from the patient.

2. The serum is diluted and mixed with VDRL antigen (cardiolipin-lecithin antigen) on a glass slide or plastic microtiter plate.
3. The mixtures are gently rotated or rocked for a specific period.
4. After incubation, the samples are examined for visible flocculation, indicated by the formation of clumps or aggregates.
5. The degree of flocculation is graded based on a scale, typically from negative to various levels of positivity.

INTERPRETATION

- A non-reactive (negative) result indicates the absence of detectable antibodies and suggests no current syphilis infection.
- A reactive (positive) result suggests the presence of antibodies, indicating a current or past infection with *Treponema pallidum*.
- False-positive results can occur due to various factors, including other infections, autoimmune diseases, and pregnancy.

HIV

PRINCIPLE

The HIV screening test detects antibodies produced by the body in response to HIV infection. It usually employs an enzyme-linked immunosorbent assay (ELISA) or rapid diagnostic tests (RDTs) to detect these antibodies. ELISA tests use antigens derived from HIV, which bind to specific antibodies present in the patient's serum. If antibodies are present, they will bind to the antigens, and this binding can be detected using colorimetric or fluorescent markers.

PROCEDURE

- ✓ Collect all the things needed for HIV Screening test by card method. Which are provided in the kit.
- ✓ Add 3 drops of buffer which provided in the kit, into the card.
- ✓ After drying, add 1 drop of serum sample into it.

- ✓ Add 5 drops of buffer and keep it for dry.
- ✓ Add 2 drops of Enzyme conjugate after drying add 5 drops of buffer.

INTERPRETATION

If 3 dots present in the card it indicates that presence of type1 &2 HIV antibody

If 2 dots in T1 and control it indicates that Type 1 HIV.

C is always control.

For HCV also same procedure can be carried out. Kit only will be changed

BLOOD BANK

INTRODUCTION

BLOOD BANK

Blood banking is the process that takes place in the lab to make sure that donated blood, or blood products, are safe before they are used in blood transfusions and other medical procedures. Blood banking includes typing the blood for transfusion and testing for infectious diseases.

FACTS ABOUT BLOOD BANK

- About 36,000 units of blood are needed every day.
- The number of blood units donated is about 13.6 million a year.
- About 6.8 million volunteers are blood donors each year.
- Each unit of blood is broken down into components, such as red blood cells, plasma, cryoprecipitate AHF, and platelets. One unit of whole blood, once it's separated, may be transfused to several patients, each with different needs.
- Annually, more than 21 million blood components are transfused.

ROLE OF BLOOD BANK

Blood banks collect, store, and provide blood. Typically, these banks collect blood from voluntary blood donors. The banks then sort blood by type, check blood to make sure it is free of disease and then store it for future use. The main mission of a blood bank is to provide life-saving blood to hospitals and other health care facilities.

STRUCTURE OF BLOOD BANK

- ✓ Reception Room
- ✓ Donation Room
- ✓ Donor Rest/ Refreshment Room
- ✓ Screening Unit
- ✓ The Laboratory
- ✓ Preservation and Storage
- ✓ Blood Bank Records

What tests are done in blood banking?

- Typing: ABO group (blood type)
- Rh typing (positive or negative antigen)
- Screening for any unexpected red blood cell antibodies that may cause problems in the recipient
- Screening for current or past infections, including:
 - Hepatitis viruses B and C
 - Human immunodeficiency virus (HIV)
 - Human T-lymphotropic viruses (HTLV) I and II

BLOOD COLLECTION

The process for collecting blood from donors is similar to that used for blood sampling; however, a few additional measures are required for collection of donated blood. These measures are primarily to ensure patient safety, but also to minimize exogenous contamination of a donated

blood unit or its derived components, particularly contamination from the skin flora of the donor's arm.

PROCEDURE OF BLOOD COLLECTION

Step 1. Identify donor and label blood collection bag and test tubes

Ensure that:

- ✓ the blood collection bag is of the correct type
- ✓ The labels on the blood collection bag and all its satellite bags, sample tubes and donor records have the correct patient's name and number;

Step 2. Select the vein

Select a large, firm vein, preferably in the antecubital fossa, from an area free from skin lesions or scars

Step 3. Disinfect the skin

If the site selected for venipuncture is visibly dirty, wash the area with soap and water, and then wipe it dry with single-use towels.

Step 4. Perform the venipuncture

In general, use a 16-gauge needle, which is usually attached to the blood collection bag. Use of a retractable needle or safety needle with a needle cover is preferred if available.

Step 5. Monitor the donor and the donated unit

- ✓ Closely monitor the donor and the injection site throughout the donation process
- ✓ About every 30 seconds during the donation, mix the collected blood gently with the anticoagulant, either manually or by continuous mechanical mixing.

Step 6. Remove the needle and collect samples

- ✓ Cut off the needle using a sterile pair of scissors.
- ✓ Collect blood samples for laboratory testing.

OBSERVATION



Figure-10

BLOOD TYPING

BLOOD GROUPING PRINCIPLE

The ABO and Rh blood grouping system is based on agglutination reaction. When red blood cells carrying one or both the antigens are exposed to the corresponding antibodies they interact with each other to form visible agglutination or clumping. The ABO blood group antigens are O-linked glycoproteins in which the terminal sugar residues exposed at the cell surface of the red blood cells determine whether the antigen is A or B.

How the Test is Performed

A blood sample is needed. The test to determine your blood group is called ABO typing. Your blood sample is mixed with antibodies against type A and B blood.

Then, the sample is checked to see whether or not the blood cells stick together. If blood cells stick together, it means the blood reacted with one of the antibodies.

The second step is called back typing. The liquid part of your blood without cells (serum) is mixed with blood that is known to be type A and type B.

People with type A blood have anti-B antibodies. People with type B blood have anti-A antibodies. Type O blood contains both types of antibodies.

The 2 steps above can accurately determine your blood type.

Rh typing uses a method similar to ABO typing. When blood typing is done to see if you have Rh factor on the surface of your red blood cells, the results will be one of these:

Rh+ (positive), if you have this cell surface protein

Rh- (negative), if you do not have this cell surface protein

OBSERVATION

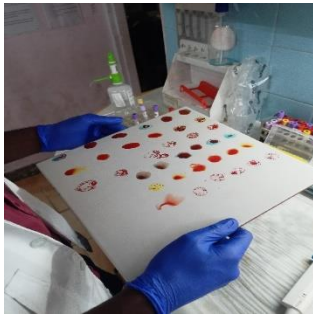


Figure-11

CROSS MATCHING

- Also known as compatibility testing.
- Cross matching is the most important test before a blood transfusion is given.
- The primary purpose of cross matching is to detect ABO incompatibilities between donor and recipient.
- This is carried out to prevent transfusion reactions by detecting Abs in recipient's serum.

FUNCTIONS OF CROSS MATCHING

Two main functions of cross matching test:

- 1) It is a confirm ABO compatibility between donor and recipient.
- 2) It may detect presence of irregular Ab in patient's serum that will react with donor RBCs.

PROCEDURE:

- ✓ Compatibility at Room Temperature -37°C
- ✓ Take 1 drop of recipient's serum/plasma in a small test tube.
- ✓ Add 5% saline suspension of donor's RBC
- ✓ Mix the two.

- ✓ Incubate at room temp.
- ✓ Centrifuge.
- ✓ Check for agglutination or hemolysis.

RESULT:

- ✓ Agglutination or hemolysis absent-match
- ✓ Agglutination or hemolysis present-mismatch

OBSERVATION

hemolysis absent in this rapid card so the results are matching. we should give the donor's blood to the recipient

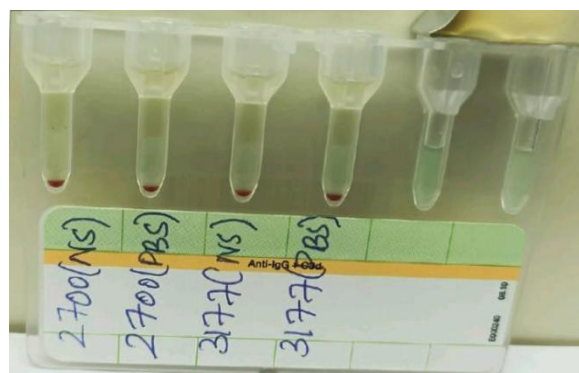


Figure-12

COMPONENTS SEPARATION

BLOOD COMPONENT

- Packed red blood cells
- Fresh frozen plasma
- Platelets
- Cryoprecipitate

Blood Separation Techniques

Plasma Separation From Blood Centrifugation

The separation of plasma from blood usually occurs through centrifugation. The physical force from continuous revolutions pushes the denser, heavier particles to the outer edges of the sample resulting in three layers of different densities: RBCs, a mixture of WBCs and platelets, and plasma.

RBC Separation from Whole Blood Sample

RBCs can be separated or isolated from whole blood in a variety of ways, but some are more efficient than others. While it might take extra money and time to preserve the extracted RBCs, certain methods (such as RBC depletion) simply remove the contaminants without damaging the surrounding blood cells.

Platelets Isolation from Whole Blood

Platelets are mainly obtained through thermophoresis. Platelet products formerly obtained from a mix of more than 10 buffy coats can now be obtained from a single thermophoresis of about 40 minutes.

Purpose of Blood Separation

Each blood cell type has its own unique purpose and function. Separating the various blood components allows scientists to analyze specific cell types. Some blood components can be used to detect diseases, while others can provide a more comprehensive understanding of the human immune response. Blood separation allows researchers to study only the target cell population without any interference from other cell types.

OBSERVATION



Figure-13

SCREENING OF DONOR BLOOD

Pre-donation screening of blood donors for Transfusion Transmissible Infections (TTI) is the practice by which a prospective donor is tested for the presence of one or more of the TTI agents by a single rapid or quick method, and donation is deferred if the test is reactive for any of the TTI markers.

Hepatitis B virus (HBV), hepatitis C virus (HCV), Human immune deficiency virus (HIV) and syphilis are the most important agents causing transfusion transmitted infections (TTIs) and they constitute large health care burdens worldwide.

HEPATITIS B VIRUS (HBV),

The hepatitis B virus surface antigen (HBsAg) has been shown to be an early marker of infection by the hepatitis B virus (HBV) and therefore, qualitative HBsAg assays like radioimmuno oassays (RIAs) and enzyme immunoassays (EIAs) have been used as screening tools for several decades .

Procedure

1. Remove the desired number of strips and secure them in the microwell frame.
2. Reseal un-used strips.
3. Add specimens according to the designation on the ELISA Working Sheet

4. Add 50 μ L of the HRP- HBsAb conjugates to each well, except the blank well.
5. Gently rock the wells for twenty second, then cover the wells.
6. Incubate the wells at 37°C for to 60 minutes.
7. Carefully remove the incubation mixture by emptying the solution into a waste container. Fill each well with diluted wash buffer and shake gently for 20-30 second.
8. Discard the wash solution completely and tapping the plate on absorbent paper. Repeat above procedure 4 more times.
9. Add 50 μ L (or 1 drop) of TMB substrate A and 50 μ L (or 1 drop) of TMB substrate B into each well including the blank well.
10. Incubate at 37°C in dark for 15 minutes.
11. Stop the reaction by adding 50 μ L (1 drop) of stop buffer to each well. Gently mix for 30 seconds. It is important to make sure that all the blue color changes to yellow color completely.
12. Set the microplate reader wavelength at 450 nm and measure the absorbance (OD) of each well against the blank well within 15 minutes after adding Stop Solution.



Figure-14

HEPATITIS C VIRUS (HCV)

Hepatitis C Virus (HCV) is now known to be the major cause of parenterally transmitted non-A, non-B hepatitis. Until the virus was characterized, diagnosis was made by exclusion of all other known causes of hepatitis. Antibody to HCV is found in over 80% of patients with well documented non-A, non-B hepatitis. The worldwide prevalence of HCV is 0.2 to 2% in blood donors and up to 80% in intravenous-drug users. HCV is an Enzyme Linked Immunosorbent Assay (ELISA) that employs highly purified recombinant antigens representing most conserved antigenic segments of Core, NS3, NS4 and NS5 antigens from multiple genotypes. These antigens are so selected that they recognize all six major genotypes of HCV prevalent worldwide.

PROCEDURE

- Add 10 ul of control or specimen in the wells
- Add 200 ul sample diluent in separate wells
- Gently shake the plate to mix thoroughly Apply plate sealer & incubate for 30mins @22-28 C
- Wash six times.Blot dry
- Add 100 ul diluted conjugate in each well & incubate for 30 mins @ 22-28 C
- Wash six times. Blot dry
- Add 100 ul ready-to-use substrate & incubate in dark for 30 mins @ 22-28 C
- Add 100 ul of stop solution to stop reaction
- Read results @ 450nm (ref:600-700nm) within 30 minutes



Figure-15

HUMAN IMMUNO DEFICIENCY VIRUS

HIV is a fourth-generation solid phase Enzyme Linked Immunosorbent Assay (ELISA) which employs Agglutinating sera for p24 antigen and highly purified recombinant antigens representing envelope glycoprotein gp 41 of HIV 1 and envelope glycoprotein gp 36 of HIV 2. The use of HIV antigens to sandwich specific antibodies enables detection of both IgG and IgM antibodies. Detection of p24 antigen also reduces window period Present evidence indicates that acquired immunodeficiency syndrome is caused by HIV-1 and HIV-2

PROCEDURE

- Add 50 µl of activated antibody reagent in each wells
- Add 100 ready-to-use substrate & incubate for 30 minutes 0 at RT (22-28 C) µl
- Add 100 diluted conjugate in each well & incubate for 0 30 minutes at 37 C µl
- Add 100 µl control or specimen in the wells
- Apply plate sealer & incubate for 60 minutes at 37 C Wash six times.
- Blot dry Wash six times. Blot dry
- Add 100 µl of stop solution to stop reaction
- Read results @ 450 nm (ref 600-700nm) within 30 minutes



Figure-16

MALARIA

Five species of Plasmodium parasite are responsible for malaria infection in humans viz P. falciparum, P. vivax, P. ovale, P. malariae and P. knowlesi. This test detects the presence of malaria genus specific pLDH released by parasitised blood cells. Since pLDH is produced by viable TM parasites, the assay can also be used to monitor success of anti-malarial therapy.

PROCEDURE

- Add 25 μ l control/whole blood specimen in separate wells.
- Add 100 μ l of antibody reagent diluted with sample diluent in each wells.
- Gently shake the plate to mix contents.
- Apply plate sealer & incubate for 30 mins at 37°C
- Wash six times with soak time of 30 sec for each wash. Blot dry
- Add 100 μ l of diluted conjugate in each wells and incubate for 30 mins at 22-28°C
- Wash six times with soak time of 30 sec for each wash. Blot dry
- Add 100 μ l of ready-to-use substrate. Incubate in dark for 30 mins at 22-28°C.
- Add 100 μ l of stop solution to stop the reaction in each wells
- Read the results at 450 nm (ref: 600 – 700 nm) within 30 mins

OBSERVATION



Figure-17

S.NO	NAME OF THE FIGURE	PAGE.NO
1	AUTO ANALYZER	3
2	IMMUNO ASSAY ANALYZER	4
3	HEMATOLOGY ANALYZER	6
4	HEMATOLOGY ANALYZER - RESULT	6
5	HBA1C ANALYZER	7
6	LEISHMAN'S STAIN SLIDE	9
7	VITEK-2	18
8	URINE STRIP	19
9	MISPA i2 -PROTEIN ANALYZER	22
10	BLOOD COLLECTION	28
11	BLOOD GROUPING	29
12	CROSS MATCHING - CARD	30
13	PLASMA SEPARATION	32
14	HBsAG KIT	33
15	HCV KIT	34
16	HIV KIT	35
17	MALARIA KIT	36

BLOOD BANK -INTERNSHIP CERTIFICATE

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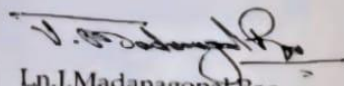
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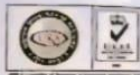
TO WHOMSOEVER IT MAY CONCERN

This is to certify that Mr. Sabarisan. V, BSc, 2nd year of Sathyabama Institute of Science and Technology, Chennai -119, undergone Internship training in Madras Egmore Lions Blood Bank & Research Foundation, Egmore, Chennai - 08. He has been observed blood bank procedures including Bleeding the Donors, Bloodgrouping, Cross-matching, Component separation, TTI screening and attend Blood donation camp for the Period from 28th Nov 2022 to 3rd Dec 2022.

During him internship, performance was good and he was able to complete the project on time.

We wish him all the best for his upcoming career.


Ln.J.Madanagopal Rao
Chairman

 This project made possible through the co-operation of Lions Club International Foundation, Clubs in the District 324 - A1, A5 & A6 and well wishers - sponsored by Lions Club of Madras Egmore

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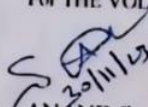
30.11.2023

TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Mr.SABARISAN.V** (Reg.No.41737014), B.Sc (MLT) student of Sathyabama Institute of Science and Technology had done his internship in the Department of Laboratory for the period from 01.11.2023 to 30.11.2023 at our Institution.

We wish him all the best for his future endeavors.

For THE VOLUNTARY HEALTH SERVICES


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CONCLUSION

With the theoretical inclination of our syllabus, it becomes very essential to take the almost advantage of any opportunity of gaining practical experience that comes along. It gave us the requisite practical knowledge to supplement the already taught theoretical concepts thus making us more competent as a computer engineer. The project from a personal point of view also helped us in understanding the following aspects of project development:

- ✓ The planning that goes into implementing a project.
- ✓ The importance of proper planning and an organized methodology
- ✓ The key element of team spirit and co-ordination in a successful project.

The project also provided us the opportunity of interacting with our teachers and to gain from their best experience